



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/798,331	03/12/2004	Stanislav Kadlec	635.43483X00	6134
20457 7590 07/01/2009 ANTONELLI, TERRY, STOUT & KRAUS, LLP 1300 NORTH SEVENTEENTH STREET SUITE 1800 ARLINGTON, VA 22209-3873				
EXAMINER				
BAND, MICHAEL A				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
07/01/2009		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/798,331

Applicant(s)

KADLEC ET AL.

Examiner

MICHAEL BAND

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 April 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 36, 49-53, 55-57, 62, 63, 67-78 and 98 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 36, 49-53, 55-57, 62-63, 67-78, and 98 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

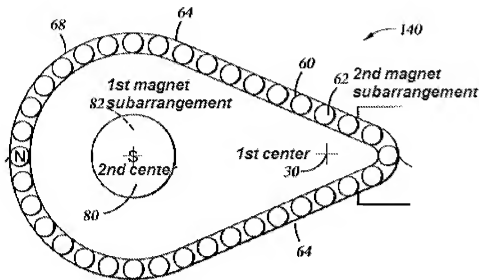
1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 36, 49-53, 55-57, 62-63, 67-69, 74-78, and 98 are rejected under 35 U.S.C. 102(b) as being anticipated by Gung (US Patent No. 6,491,801).

With respect to claim 36, Gung discloses a magnetron reactor [10] comprising an unbalanced magnetron [50] rotatable, a target [14] circular about a first center [30], and a substrate carrier [20] with a substrate [18] on the opposite side of said target [14] (abstract; fig. 1), where fig. 9 depicts another magnetron [140] similar to said magnetron [50] in fig. 1. Fig. 9 further depicts a first magnet subarrangement [82] circular about a second center and distant from the first center [30], a second magnet subarrangement [62] circular about said second center and looping around said first magnet subarrangement [82], and a third magnet subarrangement [146] located in an interspace between the periphery of the target [14] and said second magnet subarrangement [62]. The cropped figure below of fig. 9 serves to further clarify the second center.



Figs. 9-10 depict the first magnet subarrangement [82] having a polarity S pointing towards the target [14] and the second magnet subarrangement [62] having a polarity N pointing towards said target [14], where fig. 4 depicts how all three magnet subarrangements generate a magnetic flux through said target [14] and sweeping part of the magnetic flux along the substrate [18]. Fig. 4 also depicts the second magnet subarrangement [54] having a larger magnetic flux than the first magnet subarrangement [52] or [56], with it expected that the magnetic flux of the third magnet subarrangement be superimposed upon the magnetic flux of said second magnet subarrangement.

With respect to claims 49-51, 62-63, and 98, Gung discloses a magnetron reactor [10] comprising an asymmetric unbalanced magnetron [50] rotatable, a target [14] circular about a first center [30], and a substrate carrier [20] with a substrate [18] on the opposite side of said target [14] (abstract; fig. 1), where fig. 4 depicts the magnetron [50] producing a magnetic field pattern forming a closed loop in direction towards and

parallel to said target [14] with a tunnel-like arcing from an outer loop of a first magnetic pole [54] and an inner area of a second magnetic pole [56] with said magnetron magnetic field pattern being circular about a second center distant from said first center [30] and said magnetron magnetic field pattern looping around said first center [30]. Fig. 4 also depicts the a first magnetic field component [98] generated by an increased magnetic flux along the outer loop area relative to the inner area and a second magnetic field component [92] generated circularly about the first center [30] and in an interspace between said outer loop area and the target [14]. Gung further disclosed in fig. 1 a plasma being initiated by flowing argon [32] into the magnetron reactor [10] in the vicinity of the substrate [18] and igniting it into a plasma (col. 4, lines 40-51), thus the plasma treats said substrate [24].

With respect to claims 52-53, Gung further discloses that the strength of the magnetic field at the wafer is in the range of 1 to 2 Gauss (col. 8, lines 33-65).

With respect to claims 55-57, Gung further discloses in fig. 4 the magnetic field covering over 85% of the target [14], with the magnetic field homogenous along the outer loop area.

With respect to claims 67-68, Gung further depicts in fig. 1 the substrate (i.e. wafer) [18] supported on the substrate carrier [20] (col. 4, lines 24-29), with it being well known that a wafer is circular. It is inherent that the apparatus be capable of providing more than one substrate.

With respect to claims 69 and 76-77, Wang et al further discloses electrically feeding said plasma by a pulsating (i.e. RF) power supply [42] which is controlled by a controller [44] which controls the sputtering conditions (col. 4, lines 55-60).

With respect to claims 74-75, Gung further discloses the chamber pressure reduced well below 1 millitorr (0.13 Pa) (col. 5, lines 4-6).

With respect to claim 78, Gung further discloses sputtering titanium or tantalum from the metal target [14] (col. 1, lines 30-33; col. 4, lines 24-26; col. 7, lines 22-25).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 70-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gung (US Patent No. 6,491,801) as applied to claim 69 above, and further in view of Chiang et al (USPGPub 2001/0050220).

With respect to claims 70-73, the reference is cited as discussed for claim 69. Gung is limited in that while a pulsating, and therefore a frequency, is discussed, the claimed range is not specified. Gung is further limited in that while it is inherent that a duty cycle or ratio is incorporated with the power source, a specific duty cycle or ratio is not specified

Chiang et al teaches sputtering on a substrate by ionized metal plasma deposition (abstract) utilizing a similar apparatus with a magnetron [106] above a substrate [110] with a vacuum pump [146] and shield [128] (fig. 1). Chiang et al also teaches an RF power source [134] that biases the substrate (p. 2, para 0021) where the positive and negative voltage portions are sequentially alternated to result in a series of target/coil sputtering steps resulting in a frequency of between about 1 kHz and 200 kHz (p. 3, para 0030). It is well known that an RF power source is a pulsating power source as evidenced by fig. 2. Chiang et al lists the advantage of using this RF bias power as to influence the direction of ions in the chamber during processing (p. 1, para 0009). Chiang et al further teaches a duty cycle associated with the frequency range discussed earlier. Chiang et al discusses a duty cycle between about 50% and about 90% (p. 3, para 0030), leading to a conclusion that the off-time must therefore be from about 50% and about 10%. It has been held that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" *a prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Chiang et al lists the advantage of using this RF bias power, and therefore the duty cycle, as to influence the direction of ions in the chamber during processing (p. 1, para 0009).

It would have been obvious to one of ordinary skill in the art to use the bias RF power taught in Chiang et al for the power source of Gung to gain the advantage of influencing the direction of the ions during processing.

Response to Arguments

Claim Objections

5. The Applicant has amended claim 36, Section B; the objection is withdrawn.

102 and 103 Rejections

6. Applicant's arguments with respect to claims 36, 49-53, 55-57, 62-63, 67-78, and 98 have been considered but are moot in view of the new ground(s) of rejection due to the new limitations requiring the second magnet subarrangement being outside said first magnet subarrangement and looping around said first center in addition to a second magnetic field component generated in an interspace between said outer loop area and the periphery of said target.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 9am-5pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. B./

Examiner, Art Unit 1795

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1795